Nuclear Waste Transportation: Key Policy Issues & Recommendations

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Nuclear Waste Transportation: Key Policy Issues & Recommendations

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- Outlook for Shipments to a Repository and/or Storage Facility in Nevada
- Unresolved Safety Issues
- State of Nevada Recommendations to DOE

Outlook for Shipments to a Repository and/or Storage Facility in Nevada

- Repository at Yucca Mountain
  (Current DOE Plan)
- Interim Storage Facility at Nevada Test Site and Repository at Yucca Mountain
  (Originally Proposed in S. 1936 and H.R. 1020, Continued in S. 104 and H.R. 1270)
- DOE Proposal for "Market Driven" Transportation System
  (DOE Privatization RFP)

Repository at Yucca Mountain
(Current DOE Plan)

- **Shipments Begin: 2010**
- SNF Modal Mix: 12% Truck, 88% Rail
- Casks: New Designs, High-Capacity
- Rail Access, No Intermodal Transfer Facility
- Cask Shipments
  - Legal-Weight Truck: 6,300
  - Rail: 13,900
- **Total: 20,200**

Storage Facility at NTS and Repository at Yucca Mountain
(Proposed Legislation)

- **Shipments Begin: 1999 - 2003**
- SNF Modal Mix: 35% Truck, 65% Rail
- Casks: Current Designs, Current Capacity
- Intermodal Transfer Facility At Caliente
- Cask Shipments
  - Legal-Weight Truck: 79,300 (31,400)
  - Rail: 12,600
  - Heavy Haul Truck: 12,600
- **Total: 104,500 (56,600)**

Primary Routes to Nevada

HIGHWAY

Base Case: I-80, I-70, I-15 from UT

Southern: I-40, I-15 from CA

Alternate: I-20/I-10, I-15 from CA

RAIL

Base Case: Union Pacific from IL/MO/NE

Southern: Union Pacific from CA, BN/SF from MO

Alternate: Union Pacific from CA, UP(SP Sunset Route) from TX

Figure 18-1a. Life of Operations Rail and Highway Cask Shipments Current Capabilities Transportation Choices/Default Routing

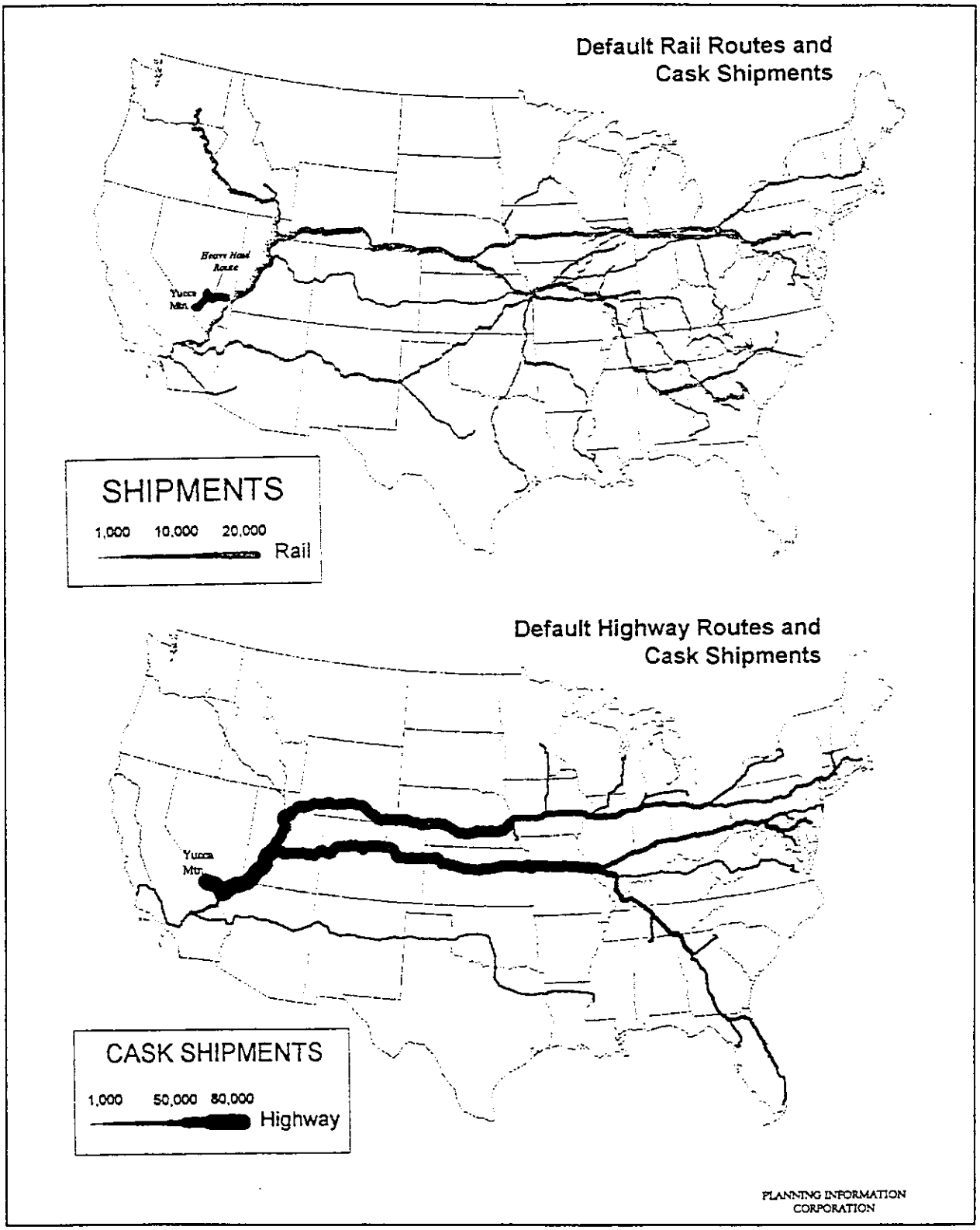
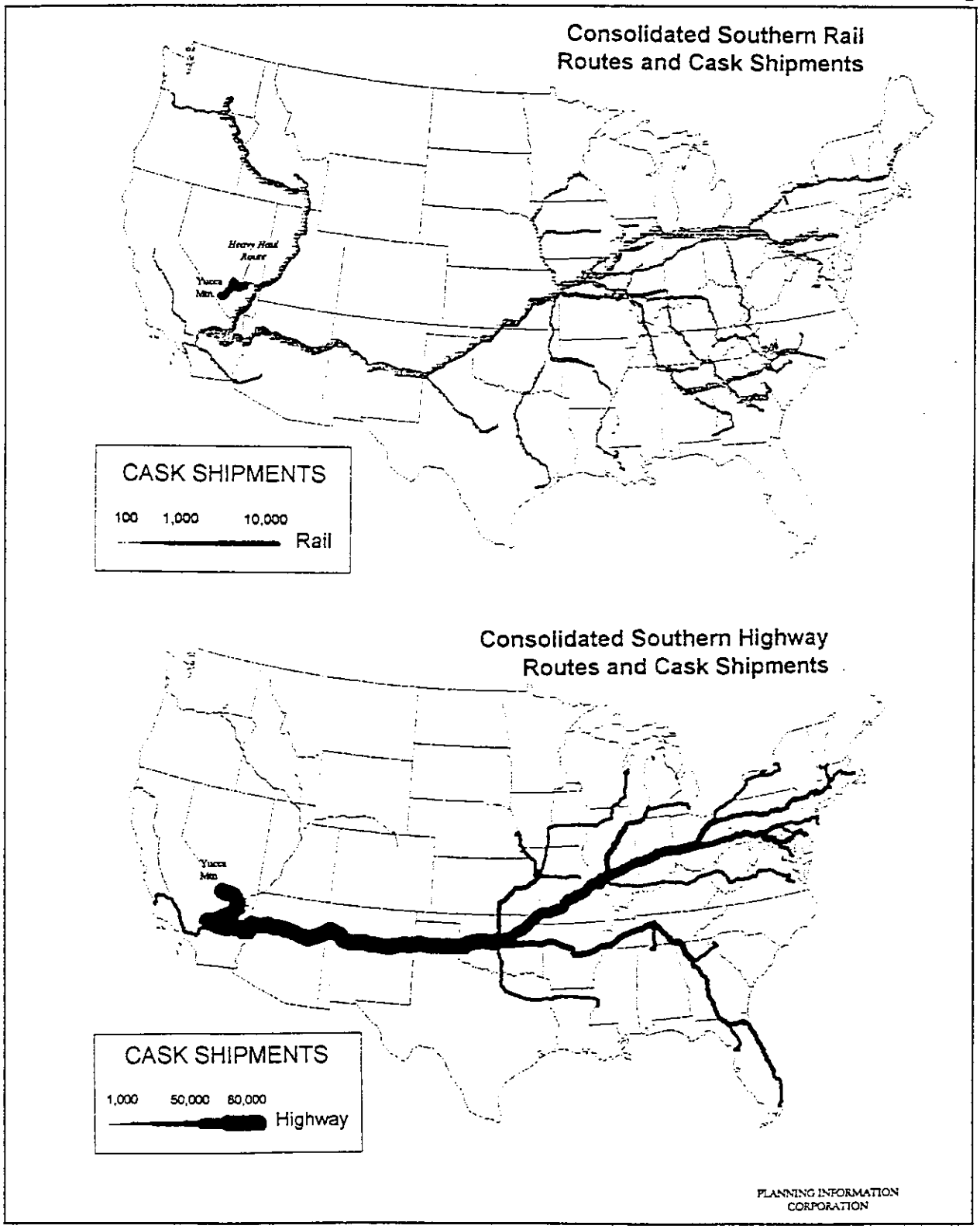
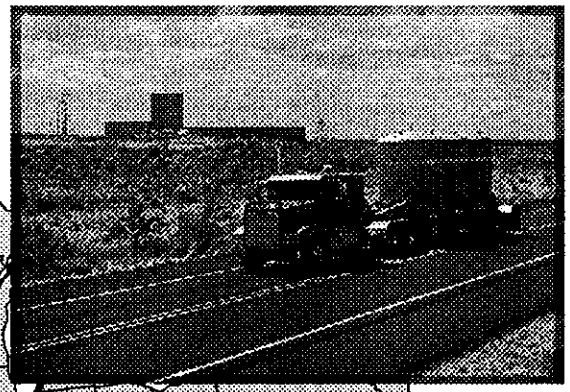
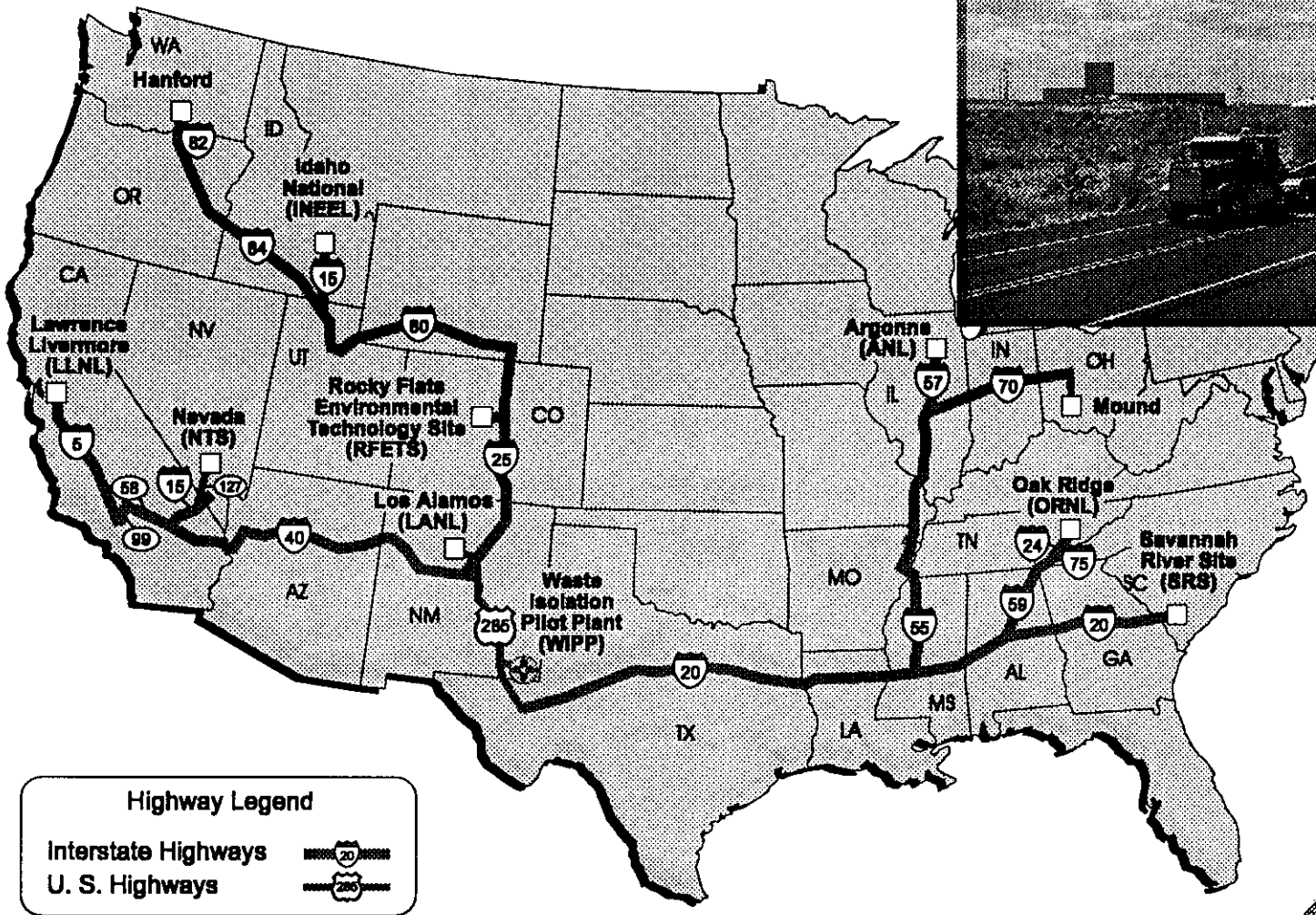


Figure 18-1b. Life of Operations Rail and Highway Cask Shipments Current Capabilities Transportation Choices/Consolidated Southern Routing



DEFENSE TRANSURANIC WASTE GENERATING AND STORAGE SITES





Unresolved Safety Issues

- Relevance of Nuclear Industry's Past Safety Record
- Radiological Risks of Routine Transportation Operations
- Probability and Severity of Transportation Accidents
- Adequacy and Enforcement of Federal Regulations
- Cask Performance in Severe Accidents and Terrorist Incidents

U.S. Civilian Spent Nuclear Fuel Shipments, 1979-1995

- Amount Shipped: 1,335 MTU (79 MTU/yr)
- Shipments: 1,306 (77/yr)
- Truck Share of Shipments: 89%
- Rail Share of MTU: 75%
- Average Rail Shipment Distance: 346 miles (79% less than 500 miles)
- Average Truck Shipment Distance: 678 miles (82% less than 900 miles)

Source: USNRC, NUREG-0725, Rev. 11 (July, 1996)

Consequences of "Gridlock" Incident
Exposure to Members of Public

- DOE Assumptions:

  - Group located 1m from vertical plane of trailer

  - 4 - 8 people in vehicles closest to trailer
  - Gridlock lasts 2 - 4 hours
  - No remedial action to move group members

  - Exposure rate to group, 5 - 10 mrem/hr

- DOE Conclusions:

  - Exposure to group member, 10 - 40 mrem

  Source: E. Darrow, OCRWM, NWTRB Mtg., Oct. 22, 1990

Consequences of Severe Accident Release in Rural Area

- Scenario: Rail Cask Involved in High-Speed Impact, Long-Duration Fire, Fuel Oxidation
- Release : 1380 curies of Co-60, Cs-134, Cs-137
- Area Contaminated: 42 Square Miles
- Clean-up Time: 460 Days
- Clean-up Cost: $620 Million

Source: Sandquist, 1985

Consequences of Terrorist Attack
Release in Urban Area

- Scenario: Terrorists Attack Truck Cask Containing 1 PWR Assembly with HED(M3A1 Military Demolition Charge)
- Hole Diameter: 152.5 mm (6.0 inches)
- Fuel Rods Damaged: 111 of 223 (50%)
- Fuel Mass Fractured: 20.82 kg (10%)
- Fuel Mass Released: 2.55 kg (5.6 pounds) (1%)
- Released as Aerosal: 2.94 g (1/10 ounce)
- Blast Effect/Shrapnel Zone: 100+ meters

Source: SAND82 - 2365 (June, 1983)

State of Nevada Recommendations to U.S. DOE Regarding Nuclear Waste Transportation System

- Comprehensive Risk Management
- Maximum Use of Rail, Dual-Purpose Casks, & Dedicated Trains
- Full-scale Cask Testing
- Comprehensive Safety Program Modelled on WGA WIPP Program
- Implementation of Section 180(c) Emergency Response Planning
- Privatization of Transportation Services
- Risks of Terrorism and Sabotage Against Nuclear Waste Shipments

DOE Should Adopt A Comprehensive Approach to Transportation Risk Management

- Transportation Comprehensive Risk Assessment (CRA) should be prepared as part of the Yucca Mountain DEIS
- CRA should be used as a working risk management tool throughout the life of the project
- CRA process must encourage public participation and address public concerns
- CRA should be the basis of risk communication throughout the life of the project

DOE Should Follow CRA Methodological Guidelines Proposed by State of Nevada

(Golding & White, 1990)

- A Comprehensive Risk Assessment (CRA) is preferred to a Probabilistic Risk Assessment (PRA).
- A CRA should calculate probabilities only where existing data, theories, and models are sufficient to support the use of rigorous quantitative methods.
- The use and limitations of expert judgment should be clearly indicated, & such judgment should be used only where more adequately derived estimates are impossible.
- Sensitivity analysis should be used to illustrate the impact of differing assumptions & variations in the quality of data.
- A CRA should cover all the sequences & phases of the transportation system for both defense & commercial wastes, & consider the full range of plausible technological configurations such as new cask designs, modal mix, & routing choices.
- A CRA should consider the likely risks involved in waste retrieval.
- The full range of initiating events should be evaluated, with particular attention to human & organizational factors, external initiating events, & sabotage & terrorism.
- The full spectrum of consequences should be carefully evaluated, with articulate attention to "signal" events & social amplification.

DOE's YM DEIS Should Clearly Answer Questions Most Commonly Raised by Members of the Public

- What types of waste will be shipped?
- How hazardous are these wastes?
- How many shipments by rail? By truck?
- What rail routes to and within Nevada?
- What highway routes to and within Nevada?
- How many accidents can be expected?
- What are the consequences of a very severe accident? Of a successful terrorist attack?
- How does DOE propose to reduce risks?
- What are DOE's emergency response plans?
- What is DOE's liability for accidents?

DOE Should Maximize Use of Rail Transport, Large Dual-Purpose Casks, and Dedicated Trains

- Maximize overall nuclear waste system reliance on rail shipments (mode of choice)
- Reduce number of shipments through use of dedicated trains & large-capacity dual purpose rail casks
- Operate under "special train" protocols as recommended by Association of American Railroads
- Early DOE and/or carrier identification of preferred cross-country mainline rail routes
- Early involvement of transportation corridor states, including financial assistance under Section 180(c)
- Adequate funding for inspections & emergency preparedness

DOE Should Adopt A Full-Scale Testing Program for Shipping Casks

- Provide meaningful stakeholder role in development of cask testing protocols, & in selection of test facilities & test personnel
- Commit DOE to full-scale physical testing of cask prototypes, preferrably prior to Nuclear Regulatory Commission certification (sequential drop, fire, puncture & immersion tests)
- Re-evaluate Modal Study findings, with meaningful stakeholder participation, using DOE repository system assumptions
- Evaluate potential benefits of testing a randomly-selected production-model cask to ensure regulatory compliance & to determine failure thresholds.

OCRWM Should Develop A Comprehensive Safety Program Modelled after WGA-DOE-State WIPP Program

- Develop comprehensive program of campaign-specific (and where appropriate mode- and route-specific) safety protocols
- Develop program cooperatively and implement through MOU or MOA
- Work through regional organizations such as Western Governors Association(WGA)
- Coordinate with Indian Tribes and local governments

OCRWM Should Adopt Specific Components of WGA-WIPP Transportation Safety Program

- Drivers/Carrier Compliance
- Independent Inspections
- Bad Weather/ Road Conditions
- Safe Parking
- Advance Notice/Tracking
- Medical Preparedness
- Mutual Aid Agreements
- Emergency Response
- Equipment
- Training/Exercises
- Public Information
- Routing
- Program Evaluation

OCRWM Should Follow WGA Recommendations For Section 180(c) Emergency Response Planning

- Use direct grants to states as mechanism for funding training
- Base program funding level on assessment of states' needs
- Train for safe routine transportation and emergency response
- Implement policies and procedures through rulemaking
- Base program on WGA's 1994 "Strawman Regulations"

OCRWM Should Address Nevada Concerns Regarding Section 180(c)

- Identify modes/routes and begin assistance 3-5 years before shipments begin
- No shipments through a jurisdiction unless adequate training assistance has been provided
- Cover full cost of emergency preparedness and safe routine transportation capabilities along NWPA transportation routes
- Facilitate reasonable equipment purchases and transfers
- Fund drills and exercises
- Apply program to all NWPA shipments, including Defense HLW/SNF, and SNF shipments to private storage facilities
- Coordinate training with other state, tribe, and federally-supported HazMat/RAM response training

OCRWM Should Completely Revise Current Approach to Privatization of Transportation Services

- Primary emphasis should be on enhanced safety and public acceptance
- Require contractors to maximize use of rail transport, dedicated trains and dual-purposecasks
- Require contractors to use routes designated by OCRWM in consultation with States and Indian Tribes

OCRWM Proposal for Privatization of Transportation ServicesShould Address Specific Nevada Concerns

- Potential for greater reliance on truck transport, icreased number of shipments, and resulting impacts
- Uncertainty about state oversight rights and opportunity for stakeholder involvement
- Regional approach to contracting (minimum 4 regions, 2 contractors)
- Coordination with other repository shipments(DOE SNF, HLW) and other DOE RAM shipments(WIPP) along same corridors
- Yucca Mountain highway and rail access and infrastructure upgrade requirements

DOE Should Reevaluate Risks of Terrorism and Sabotage Against Nuclear Waste Shipments

- Evaluate Terrorism/Sabotage Consequences in EISs for Yucca Mtn Repository, NTS Storage Facility, and Transportation Infrastructure
- Incorporate Terrorism/Sabotage Risk Management and Countermeasures in All Transportation Plans and Contracts (including "Market Driven" Strategy)
- Prepare Comprehensive Report on Liability for Terrorism/Sabotage Costs and Damages Under Price-Anderson System